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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/927,265	08/10/2001	Thomas M. Barbara	01-04 US	5283

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EXAMINER

VARGAS, DIXOMARA

ART UNIT PAPER NUMBER

2862

DATE MAILED: 08/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/927,265

Applicant(s)

BARBARA, THOMAS M.

Examiner

Dixomara Vargas

Art Unit

2862

-- Th MAILING DATE of this communication app ars on th cov r sh t with th correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4, 7-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mansfield et al. (US 4,978,920).

With respect to claim 1, Mansfield discloses an extended Maxwell pair comprising (Figures 19 and 25): a pair of semi-cylindrical gradient coils disposed coaxially around and along a z-axis extending in z-direction and symmetrically with respect to an origin (Figures 19 and 25), each being of radius a and of axial length d (Column 12, lines 18-32; Figures 19 and 25), said pair being mutually separated by a center-to-center distance Z_0 which is greater than d (Figures 19 and 25); and means for causing same currents to flow through said gradient coils in mutually opposite directions (Figures 19 and 25; as shown by arrows); values of d and Z_0 being selected such that said equal currents generate a magnetic field along said z-axis with a linear gradient near said origin in said z-direction (Column 12, lines 27-29).

Mansfield discloses the claimed invention except for the coil pair being completely cylindrical. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Mansfield for the purpose of obtaining a stronger field by

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generating a field with an extended coil covering the region of interest with a complete structure and acquiring an image through an extended field of view depending on the area to be examined.

3. With respect to claims 2 and 12, Mansfield discloses a pair of cylindrical shield coils disposed coaxially around said gradient coils, each of said shield coils being of radius b which is greater than a (Column 17, lines 30-34; Figure 25, #S1 and #S2), said means causing said equal currents to flow through said shield coils, said shield coils serving to cancel magnetic field outside said shield coils (Column 12, lines 29-32).

4. With respect to claims 3 and 4, Mansfield discloses said magnetic field along said z -axis, when expanded in a polynomial form in z , does not include a cubic term (Column 12, lines 35-50).

5. With respect to claim 7, Mansfield discloses each of said shield coils comprises a wire which is wound cylindrically at specified intervals, said intervals being determined such that said shield coils have effects of canceling magnetic field outside (Column 12, lines 29-32; Figure 25).

6. With respect to claims 8 and 19, Mansfield discloses a and d are of a same order of magnitude (Figures 19 and 25).

7. With respect to claims 9, 13-16, Mansfield discloses the claimed invention except for a , b , d and Z_0 satisfy an equation given by $\int^{k_{\max}} dk k^4 \{ \sin(kd/2) \sin(kZ_0/2) / (kd/2) \} S_0(k) K_0'(ka) I_0(k\rho) = 0$

where $S_0(k) = 1 - K_1(kb) I_1(ka) / K_1(ka) I_1(kb)$, and K_1 are modified Bessel functions, k_{\max} is an appropriately selected upper limit of integration and ρ is an appropriately selected value less than

a. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a Bessel function variation for the purpose of expressing the current flow of a coil structure.

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8. With respect to claims 10 and 17, Mansfield discloses the claimed invention except for said gradient coils and said shield coils are structured such that said equal currents will have current distribution along said z-axis given by j and j respectively for said gradient coils and said shield coils, and an shielding equation given by $I^s(k) = -(a/b)(I_1(ka)/I_1(kb))I^p(k)$ is satisfied where I_1 , are modified Bessel functions of the first kind, $I_p(k)$ and $I_s(k)$ are current density functions $I_p(z)$ and $I_p(z)$ respectively for said gradient coils and said shield coils Fourier-transformed into k-space, $I_p(z) = \int_{-\infty}^z dz' j^p(\varphi, z')$ and $I_s(z) = \int_{-\infty}^z dz' j^s(\varphi, z')$. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a Bessel function variation for the purpose of expressing the current flow of a coil structure.

9. With respect to claim 18, Mansfield discloses the claimed invention except for said formula for canceling magnetic field out said shield coils is given by $I^s(k) = -(a/b)(I_1(ka)/I_1(kb))I^p(k)$. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Mansfield for the purpose of obtaining a stronger field and avoid the gradient field to interfere with another RF field.

10. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mansfield et al. (US 4,978,920) in view of Vavrek et al. (US 5,185,576).

With respect to claims 5 and 6, Mansfield discloses the claimed invention except for said gradient coils comprises a helically rolled rectangular conductor sheet. Vavrek discloses said helically rolled structure (Figures 2 and 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Mansfield using Vavrek teachings for the purpose of avoiding interaction between the gradient with any other RF coil and improving the SNR (Column 4, lines 3-17).

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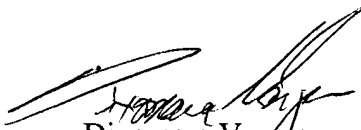
Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional prior art cited on the PTO 892 attached discloses Maxwell coil pairs structures.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dixomara Vargas whose telephone number is (703) 305-5705. The examiner can normally be reached on 8:00 am. to 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (703) 305-4816. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3432 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.


Dixomara Vargas
August 26, 2002


EDWARD LEFKOWITZ
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